

**Summary Minutes of the
U.S. Environmental Protection Agency (EPA)
Science Advisory Board (SAB)
Panel for the Review of Hydraulic Fracturing Study Plan
Public Teleconference
May 25, 2011**

Date and Time: Wednesday, May 25, 2011, 1:00 P.M. – 4:00 P.M.

Location: Teleconference Only

Purpose: The purpose of the May 25th teleconference call is for the Panel to continue to discuss substantive comments from Panel members on the draft SAB report *Review of EPA's Draft Hydraulic Fracturing Study Plan*.

Participants:

SAB Panel: Panel for the Review of draft Hydraulic Fracturing Study Plan (See Roster, Attachment A)

Dr. David A. Dzombak, Chair
Dr. George Alexeeff
Dr Tom Ballestero
Dr. Mark Benjamin
Dr. Michel Boufadel
Dr. Elizabeth Boyer
Mr. David Burnett
Dr. Thomas L. Davis
Dr. Shari Dunn-Norman
Dr. John P. Giesy
Dr. Jeffrey Griffiths
Dr. Phillip Gschwend
Dr. Cynthia M. Harris
Dr. Nancy K. Kim
Dr. Cindy M. Lee
Dr. Duncan Patten
Dr. Stephen Randtke
Dr. Danny Reible
Dr. Connie Schreppel
Dr. Geoffery Thyne
Dr. Jeanne VanBriesen
Dr. Radisav Vidic

Dr. George Alexeeff, Dr. Tom Ballestero, Dr. Michel Boufadel, Dr. Thomas L. Davis, Dr. Shari Dunn-Norman, Dr. John P. Giesy, Dr. Jeffrey Griffiths, Dr. Danny Reible, Dr. Connie Schreppel, Dr. Geoffery Thyne, and Dr. Radisav Vidic could not participate at the teleconference but provided written comments in preparation for the teleconference call.

EPA SAB Staff: Mr. Edward Hanlon, Designated Federal Officer

EPA Staff: Dr. Fred Hauchman, EPA Office of Research and Development

Other Attendees: A list of members of the public who requested information for calling into the teleconference is provided in Attachment B, Public Attendance.

Materials Available: The agenda and teleconference materials were circulated to the Panel in advance of the teleconference. These materials were made available to the public via the SAB Web site (www.epa.gov/sab). The teleconference materials are available on the following SAB Hydraulic Fracturing (HF) May 25, 2011 teleconference website:
<http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/9329988d4097b8858525786900685f1c!OpenDocument&Date=2011-05-25>.

Meeting Summary

The meeting was announced in the Federal Register¹ and proceeded according to the meeting agenda². A summary of the meeting follows.

May 25, 2011

Opening Statements and Welcome

Mr. Ed Hanlon, the Designated Federal Officer (DFO), opened the teleconference, and made a brief opening statement noting that the HF Study Plan Review Panel is a Federal Advisory Committee under the Federal Advisory Committee Act (FACA). He noted the teleconference was open to the public and that the teleconference was continuing the teleconference that occurred on May 19, 2011. He also noted that several sets of written comments were received from the public and were posted onto the teleconference website. Mr. Hanlon also noted minutes of the meeting were being taken to summarize discussions and action items in accordance with requirements under FACA. He then turned the teleconference call over to the Chair, Dr. David Dzombak.

Dr. Dzombak welcomed everyone and noted this is an Advisory effort where a report seeking consensus was being prepared. He reviewed the agenda for the meeting and noted that Panel member preliminary comments to SAB's 4/28/11 draft report were posted on SAB's teleconference website. He summarized the May 19, 2011 teleconference, and noted that during that teleconference, the Panel completed its initial discussion on the body of the draft SAB report. He noted that the May 25 teleconference would discuss Panel member comments to the draft cover letter and to the Executive Summary. He also noted that any additional comments to the body of the draft SAB report would also be requested. He then introduced Dr. Fred Hauchman of EPA's Office of Research and Development (ORD) for his remarks.

EPA Remarks

Dr. Fred Hauchman of EPA ORD noted that one area needing clarification is EPA's water acquisition discussion regarding water fluxes and mass balances. He noted that EPA's analytical focus would be on impacts to drinking water resources. He also stated that EPA would provide

further clarification in the Study Plan regarding Environmental Justice (EJ). He noted EPA would conduct a screening analysis to evaluate whether there are EJ communities in areas where HF is occurring. He anticipated that EPA would not have data to do a full EJ impact analysis. He also asked the SAB to state its concerns more clearly regarding post closure and well abandonment. He thanked the Panel for its hard work.

Dr. Dzombak responded that SAB's comments regarding water acquisition were primarily on the link between the hydrological cycle and HF. The SAB focus related to water quantity impacts to drinking water resources, the overall impacts of water withdrawals, and the extent that water is coming back into local/regional watershed from HF resources. Dr. Dzombak noted the Panel supported EPA's proposed EJ activities. He also noted that the Panel revised its draft text related to post closure and well abandonment.

Dr. Dzombak stated that the Panel discussed proposed revisions to the draft SAB letter and report during the May 19 teleconference, and Panel members emailed proposed revisions and comments to the draft SAB letter and report to himself and the DFO after the May 19 teleconference. He stated that an updated clean and redline draft of the SAB letter and report dated May 24 were posted on the May 25 teleconference website, and noted the clean May 24 draft would be discussed over the next few hours of this teleconference.

Cover Letter Comments:

Dr. Dzombak requested comments on the cover letter, going paragraph by paragraph in the May 24, 2011 draft SAB Report. Several Panel members requested that the letter add emphasis on water quantity and issues related to healthy ecosystems and drinking water; Dr. Dzombak noted various clarifications would be added to the letter on that topic.

The Panel discussed its recommendations on EJ, and agreed that the letter should be revised to recommend that EPA should assess EJ issues associated with HF through a national screening analysis and within the individual case studies that would be conducted.

The Panel also discussed the letter's statements on flowback and produced water, and recycling of HF waters. The Panel revised language in the letter and body of the draft SAB report, and adjusted text on these topics to improve consistency throughout the report. The Panel also agreed that the SAB letter and report should note that since EPA's HF research addresses only several types of HF activity, EPA's research results should not be generalized across all types of HF activity.

Executive Summary Comments:

Dr. Dzombak requested comments on the executive summary, going section by section in the May 24, 2011 draft SAB Report.

Under the Charge Question 1 response, Dr. Dzombak noted that additional text was added to the May 24 draft executive summary to note that Figure 7 of the draft Study Plan was incomplete. The Panel discussed whether to recommend addition of a post closure/abandonment stage to the HF analysis, and considered the revised draft language on this topic that was provided in the May 24 draft report. The Panel agreed that EPA should assess the potential impacts that abandoned wells in the vicinity of HF operations may have on facilitating contaminant and fluid transport in the HF area. The Panel also discussed and agreed that EPA should do a literature

search to identify published studies that have highlighted such problems in the past.

Under the Charge Question 2 response, the Panel removed several words that added inconsistency between the revised cover letter and the executive summary. The Panel further discussed the language on inherent risks of HF, and agreed that the current draft language was adequate.

Dr. Dzombak requested comments on the Charge Question 3 revised draft language and the Panel had no further changes to recommend. Under the Charge Question 4(a) response, the Panel discussed the text that referred to potential implications of the limited time and budget for ORD's study activities. The wording was changed to recognize the updated statements provided by Dr. Briskin during the May 19 teleconference on this topic. Dr. Dzombak requested comments on the Charge Question 4(b) revised draft language and the Panel had no further changes to recommend.

Within the Charge Question 4(c) revised draft language, the Panel discussed and revised the text to emphasize that EPA should narrow the scope of activities to specific case studies and site investigations in order to meet the time constraints of the research project. Dr. Dzombak requested comments on the Charge Question 4(d) revised draft language and the Panel had no further changes to recommend. The Panel discussed its draft response to Charge Question 4(e) and revised its comments recommending that EPA define post HF water in order to help clarify which HF waters were being treated or disposed.

Within the Charge Question 5 revised draft language, the Panel discussed and agreed to remove its statements that SAB did not believe that EPA's research outcomes could be achieved regarding surface spill contamination of drinking water resources and regarding risks posed to drinking water resources by current methods for on-site management of HF wastes. In addition, the Panel agreed to revise its draft text regarding Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act, to clarify that EPA should assess more than only contaminants with MCLs in order to assess all potentially significant impacts on drinking water quality. The Panel also agreed to clarify its comments regarding spatial and temporal impacts to water quality.

Comments to the Body of the draft SAB Report:

Dr. Dzombak then requested Panel comments to the individual responses to each charge question, as revised within the May 24 draft SAB report. The Panel deleted several words and sentences in the response to Charge Question 2. Additional language was added to Charge Question 2 and 4(a)'s response to more completely describe the Panel's concern that EPA assess cumulative impacts of HF to drinking water resources. The Panel added text into the first paragraph of Charge Question 4(a) to summarize more clearly the SAB's response to the charge question. Additional text was inserted into the response to Charge Question 4(c) to clarify the Panel's concerns regarding well injection, as discussed on the May 19 teleconference call.

The Panel deleted redundant text in the response to Charge Question 4(d) that was previously raised in discussion of the draft report's text in the response to Charge Question 4(c) associated with leakage from storage areas, leakage from HF injection wells, leakage along faults or up abandoned wells, and seepage into the ground if land applied. The Panel also adjusted text in the response to Charge Question 4(c) associated with land application and dust suppression.

Dr. Dzombak then discussed next steps and action items. He noted that the Panel identified consensus language for changes to the draft cover letter, executive summary, and body of the draft SAB report, and that he and the DFO would produce a revised draft version with redline text indicating changes to the May 24 draft letter and report. Dr. Dzombak noted that that version would be sent to the Panel for its further review and agreement to send the revised draft to the chartered SAB for quality review and approval.

With the meeting business concluded, the Designated Federal Officer Edward Hanlon adjourned the meeting at 4:00 pm ET.

Respectfully Submitted:

/signed/

Mr. Edward Hanlon
Designated Federal Officer

Certified as Accurate:

/signed/

Dr. David A. Dzombak
Chair
EPA SAB Staff Office Panel for the
Review of Hydraulic Fracturing
Study Plan

NOTE AND DISCLAIMER: The minutes of this public teleconference reflect diverse ideas and suggestions offered by Panel members during the course of deliberations within the teleconference. Such ideas, suggestions and deliberations do not necessarily reflect consensus advice from the Panel members. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters or reports prepared and transmitted to the EPA Administrator following the public meetings or teleconferences.

Materials Cited

The following meeting materials are available on the SAB website: <http://www.epa.gov/sab>, at the Hydraulic Fracturing (HF) May 25, 2011 teleconference website: <http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/9329988d4097b8858525786900685f1c!OpenDocument&Date=2011-05-25>:

¹ Federal Register Notice Announcing the Teleconference

² Agenda for May 25, 2011 Public Teleconference

ATTACHMENT A – ROSTER

U.S. Environmental Protection Agency Science Advisory Board Hydraulic Fracturing Study Plan Review Panel

CHAIR

Dr. David A. Dzombak, Walter J. Blenko Sr. Professor of Environmental Engineering, Department of Civil and Environmental Engineering, College of Engineering, Carnegie Mellon University, Pittsburgh, PA

MEMBERS

Dr. George Alexeeff, Deputy Director for Scientific Affairs, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, Oakland, CA

Dr Tom Ballestero, Professor, Civil Engineering, University of New Hampshire, Durham, NH

Dr. Mark Benjamin, Professor, Department of Civil and Environmental Engineering, University of Washington, Seattle, WA

Dr. Michel Boufadel, Professor of Environmental Engineering, Civil and Environmental Engineering, College of Engineering, Temple University, Philadelphia, PA

Dr. Elizabeth Boyer, Associate Professor, School of Forest Resources and Assistant Director, Pennsylvania State Institutes of Energy & the Environment, and Director, Pennsylvania Water Resources Research Center, Pennsylvania State University, University Park, PA

Mr. David Burnett, Directory of Technology, GPRI, Department of Petroleum Engineering, Look College of Engineering, Texas A&M University, College Station, TX

Dr. Thomas L. Davis, Professor, Department of Geophysics, Colorado School of Mines, Golden, CO

Dr. Shari Dunn-Norman, Professor, Geological Sciences and Engineering, Missouri University of Science and Technology, Rolla, MO

Dr. John P. Giesy, Professor and Canada Research Chair, Veterinary Biomedical Sciences and Toxicology Centre, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

Dr. Jeffrey Griffiths, Associate Professor, Department of Public Health and Community Medicine, School of Medicine, Tufts University, Boston, MA

Dr. Phillip Gschwend, Professor, Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA

Dr. Cynthia M. Harris, Director and Professor, Institute of Public Health, Florida A&M University, Tallahassee, FL

Dr. Nancy K. Kim, Senior Executive, Health Research, Inc., Troy, NY

Dr. Cindy M. Lee, Professor, Department of Environmental Engineering and Earth Sciences, Clemson University, Anderson, SC

Dr. Duncan Patten, Research Professor, Hydroecology Research Program, Department of Land Resources and Environmental Sciences, Montana State University, Bozeman, MT

Dr. Stephen Randtke, Professor, Department of Civil, Environmental, and Architectural Engineering, University of Kansas, Lawrence, KS

Dr. Danny Reible, Professor, Department of Civil, Architectural and Environmental Engineering, University of Texas, Austin, TX

Dr. Connie Schreppel, Director of Water Quality, Mohawk Valley Water Authority, Utica, NY

Dr. Geoffery Thyne, Sr. Research Scientist, Enhanced Oil Recovery Institute, University of Wyoming, University of Wyoming, Laramie, WY

Dr. Jeanne VanBriesen, Professor, Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, PA

Dr. Radisav Vidic, Professor and Chairman, Civil and Environmental Engineering, University of Pittsburgh, Pittsburgh, PA

SCIENCE ADVISORY BOARD STAFF

Mr. Edward Hanlon, Designated Federal Officer, U.S. Environmental Protection Agency, Washington, DC

ATTACHMENT B – Other Attendees

List of Members of the Public Who Requested Information for Calling into the Public Teleconference of the SAB Panel for the Review of Hydraulic Fracturing Study Plan, or Who Indicated They Were On the Teleconference

May 25, 2011

| Name | Affiliation |
|-----------------------|---|
| Alexander, Bruce | Exelon Corporation |
| Armstrong, Matthew J. | Bracewell & Giuliani LLP |
| Becker, Joshua L. | Alston & Bird, LLP |
| Bolich, Rick | North Carolina Department of Environment and Natural Resources |
| Bravender, Robin | Politico |
| Brownell, Mike | Chesapeake Energy Corporation |
| Browning, Andrew | HBW Resources LLC |
| Burckhalter, Angie | Oklahoma Independent Petroleum Association |
| Cappiello, Dina | The Associated Press |
| Casper, Andrew | Colorado Oil & Gas Association |
| Clark, Christy | State of Michigan Office of the Great Lakes |
| Connors, Mark S. | Erie County Water Authority |
| Cooper, Nicole | Dallas City Hall |
| Davis, R. Jeffrey | Cardno ENTRIX |
| DeBard, Amanda | Potomac Research Group |
| Deeley, George | Shell Upstream Americas |
| DiCosmo, Bridget | Inside EPA |
| Dolan, Donna M. | Environmental Standards, Inc. |
| Dzubin, Brian | Conoco Phillips Corporation |
| Ekstrom, Megan | Cassidy & Associates |
| Erraguntla, Neeraja | Texas Commission on Environmental Quality |
| Etengoff, Bracha | National Environmental Law Center |
| Evans, Scott B. | Millennium Management, LLC |
| Fuller., Lee | Independent Petroleum Association of America (IPAA) |
| Gallo, Thomas F. | Emerald Development Managers |
| Gill, Clint | Conoco Phillips Corporation |
| Grady, Sarah | American Continental Group |
| Greenwalt, Denise | State of Pennsylvania Department of Environmental Protection |
| Greissing, Chris | Industrial Minerals Association - North America |
| Guith, Christopher | U.S. Chamber of Commerce |
| Handy, Alicia | Wilmer, Cutler, Pickering, Hale, and Dorr, LLP |
| Horwitt, Dusty | Environmental Working Group (EWG) |
| Hufford, Walt | Talisman Energy USA, Inc. |

| Name | Affiliation |
|---------------------------|--|
| Jester, Stephen L. | Conoco Phillips Corporation |
| Kaplowitz, Joshua | Katten, Muchin & Rosenman, LLP |
| Klein, Michael D. | Robson Forensic, Inc. |
| Lewis, Aurana | Duke University |
| Martin-McNaughton, Jamie | Potomac-Hudson Engineering, Inc. |
| Marty, Gabriel | Embassy of France for the United States |
| Mason, Deirdre | Association of State Drinking Water Administrators |
| Meadows, Stephanie R. | American Petroleum Institute |
| Mendoza, Mary | Haynes and Boone, LLP |
| Miner, Michael | Drinker, Biddle, & Reath, LLP |
| Mize-Spansky, Kristine L. | Encana Corporation |
| Moldenhauer, Charles B. | Morgan, Lewis & Bockius, LLP |
| Murphy, Jim | National Wildlife Federation |
| Natalie Joubert | Consumer Energy Alliance |
| Pagliocca, Rachel | Golin Harris, Inc. |
| Plummer, Annika | Southwest Water Authority |
| Popeil, Jaclyn | Conoco Phillips Corporation |
| Power, Stephen | The Wall Street Journal |
| Rawleigh, Francesca | Marwood Group |
| Reamer, Christine | National Ground Water Association |
| Seitz, J. Barton | Baker, Botts LLP |
| Sinclair, Les | L48 Drilling & Completions |
| Tollefson, Jeff | Nature Magazine |
| Valade, Matthew | Hazen and Sawyer P.C. |
| Watson, James F. | Inflection Energy, LLC. |
| White, Rodney | Platts Gas Daily |
| Wilson, Laurie | RPS Group Plc |
| Wong, Jetta | U.S. House of Representatives Subcommittee on Energy and Environment |
| Wright, Ben | Hazen and Sawyer, P.C. |
| Young, Sue | Delaware Riverkeeper Network |